

	Division of Environmental Health and Communicable Disease Prevention	
	<b>Section: 4.0 Diseases and Conditions</b>	New 8/03
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## **T-2 MYCOTOXICOSIS**

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## T-2 MYCOTOXICOSIS

### Overview <sup>(1,2)</sup>

***T-2 mycotoxins are a potential bioterrorism weapon. If you suspect that you are dealing with a bioterrorism situation, immediately contact your [Senior Epidemiology Specialist for the region](#), or the Department of Health and Senior Service’s Situation Room (DSR) at 800-392-0272.***

Tricothecene (T-2) mycotoxins are naturally occurring toxins produced by the fusarial species of fungus. The toxin is a public health concern as it can cause severe adverse reactions in humans either from natural causes or from exposure due to an intentional act of bioterrorism. T-2 mycotoxins are unique among biotoxins as it is the only known biologically active toxin that can cause disease through dermal, gastrointestinal and inhalational exposure.

In the environment, T-2 mycotoxins have been known to cause disease to humans through ingestion of moldy wheat or corn grain. Ingestion of the T-2 mycotoxins in the past has caused persons to develop the clinical syndrome alimentary toxic aleukia (ATA), with a high mortality rate. During one such incident in Russia after World War II, the mortality rate was 10 to 60%.

As a biological warfare agent, T-2 mycotoxins are better suited for use against individuals or small groups of people as large quantities of the toxin are difficult to produce. The toxin is highly effective against individuals due to the multiple portals of entry into the human body.

### Case Definition <sup>(1,2)</sup>

#### ***Clinical description***

An illness of acute onset characterized by one or more of the following sets of signs/symptoms, which may have their onset minutes, to a few (2-4) hours after exposure.

**Gastrointestinal:** Illness caused by ingestion of T-2 mycotoxins. Signs/symptoms include vomiting, cramping abdominal pain, watery or bloody diarrhea and anorexia. Ingestion can also induce intense symptoms in the throat and esophagus including severe throat pain and blood-tinged saliva.

**Respiratory:** Illness caused by inhalational exposure to T-2 mycotoxins. Symptoms include cough, dyspnea, wheezing and a typical progression to hemoptysis.

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**Dermal:** Illness caused by skin exposure to T-2 mycotoxins. Erythema and pain in exposed areas, progressive blistering and skin necrosis. Symptoms due to exposure to head, nose, and throat can include erythema and pain in the nasal and oral cavities, nasal pruritus, and rhinorrhea. Exposure to the eyes can result in tearing and eye pain with scleral induration.

***Laboratory criteria for diagnosis***

Specific diagnosis of T-2 mycotoxicosis in the form of a rapid diagnostic test is not presently available in the field. Diagnosis can be aided with the detection of T-2 mycotoxins from a reference laboratory using clinical samples tested using a gas liquid chromatography-mass spectrometry technique. Serum and urine can be collected and sent to a reference lab for antigen detection. Pathologic specimens include blood, urine, lung, liver, and stomach contents. Clinical and epidemiological findings provide clues to the diagnosis. Urine of patients should be assessed 6 days following exposure; serum or tissue samples should be collected 1-5 days post-exposure. High attack rates, dead animals of multiple species, and physical evidence such as yellow, red, green, or other pigmented oily liquid are suggestive of mycotoxins. Rapid onset of symptoms in minutes to hours supports a diagnosis of a chemical or toxin attack.<sup>(2)</sup>

***Case classification***

*Confirmed:* a clinically compatible case that is laboratory confirmed.

*Presumptive:* a clinically compatible case that is epidemiologically linked to a specific place and/or time T-2 mycotoxins were believed to have been released.

**Information Needed for Investigation**

**Verify the diagnosis.** What are the patient’s clinical signs and symptoms? What laboratory tests were conducted? What were the results?

**Establish the extent of illness.** Are there other individuals with similar signs/symptoms (includes household and other close contacts)? Characterize information by person, place, and time. Information may be obtained by talking with patients, health care workers, and emergency workers, etc.

**Determine the form of the illness as soon as possible.**

- Usually symptoms of T-2 mycotoxicosis begin within 2 to 4 hours of exposure to mycotoxins (or immediately if exposure was significant).
- Illness caused by ingestion of T-2 mycotoxins. Signs/symptoms include vomiting, cramping abdominal pain, watery or bloody diarrhea and anorexia. Ingestion can also induce intense symptoms in the throat and esophagus including severe throat pain and blood-tinged saliva.
- Illness caused by inhalational exposure to T-2 mycotoxins. Symptoms include cough, dyspnea, wheezing and a typical progression to hemoptysis.

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- Illness caused by skin exposure to T-2 mycotoxins. Erythema and pain in exposed areas, progressive blistering and skin necrosis. Symptoms due to exposure to head, nose, and throat can include erythema and pain in the nasal and oral cavities, nasal pruritus, and rhinorrhea. Exposure to the eyes can result in tearing and eye pain with scleral induration.

**Determine the source of the exposure to prevent other cases.**

- Assist patients with identifying possible exposure sources. (Inhalation, Ingestion or Dermal).
- If the patient exhibits inhalational or the dermal form of exposure, determine the recent locations that the patient has visited.
- If ingestion of T-2 mycotoxins is indicated as the source of exposure, obtain a history of food and water consumption in the last 24 hours (with emphasis on the last 2-4 hours), if available obtain samples of the suspected food or water source.
- Have there been other cases linked by time, place or person?

**WARNING:** T-2 Mycotoxins are easily absorbed through the skin as well as through the respiratory tract. Do **not** come in contact with contaminated patients, or their clothing. Do **not** enter a suspect area or conduct environmental sampling unless you are trained and equipped to do so safely.

**Notification and Control Measures:**

- **Contact the Senior Epidemiology Specialist for the region, or the Department of Health and Senior Service’s Situation Room (DSR) at 800-392-0272 (24/7) immediately upon learning of a suspected case of T-2 mycotoxicosis.**
- Contact the Bureau of Child Care (573-751-2450) if cases are associated with a childcare facility.
- Contact the Section for Long-term Care Regulation (573-526-0721) if cases are associated with a long-term care facility.
- Contact the Bureau of Health Facility Regulation (573-751- 6303) if cases are associated with a hospital or hospital-based long-term care facility.

**Control Measures**

See USAMRIID’s Medical Management of Biological Casualties Handbook (The Blue Book) pages 72-74.

See the Work-up and Treatment sections of the eMedicine Journal, “CBRNE – T-2 Mycotoxins”.

- Decontamination is extremely important in order to avoid cross-contamination.
- Never assume that a patient has been decontaminated. Contact precautions are warranted until decontamination is assured; then standard precautions should continue to be followed.

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Reassess the patient's decontamination status. If the degree of prehospital decontamination is uncertain, rewash the patient to ensure the safety of staff and facility.

- Hazardous materials teams should be used in patient rescue and decontamination.
- Clothing of persons exposed to T-2 mycotoxins should be removed and destroyed or decontaminated.
- No specific antidote is available for the T-2 mycotoxins.
  - Provide supportive measures addressing respiratory and cardiovascular status as necessary.
  - Administer superactivated charcoal if toxin ingestion is a possibility. (Superactivated charcoal to absorb swallowed T-2 should also be administered to victims of an unprotected aerosol attack.)
  - If the patient complains of eye pain or tearing, irrigate the eyes with copious amounts of water.
  - You may contact the regional poison control center for additional clinical guidance. (800)-222-1222.

Decontamination is as follows:

- Remove all of the patient's clothing and clean and scrub the entire skin surface with soap and water. Washing the contaminated area(s) of the skin within 6 hours post exposure can remove 80-98% of the toxin and has been demonstrated to prevent skin lesions and death in experimental animals.
- Contain clothing to avoid contamination of the environment.<sup>(2)</sup>

**WARNING:** This is a dermally active toxin that is transmissible in the healthcare setting. Do not approach the patient without adequate protective gear. Clinicians must use precautions and use protective clothing when seeing a patient that is suspected of being exposed to T-2 mycotoxins.

**General Information:**

- Ensure that food items made from grains are from an inspected, approved source.
- Patients with cutaneous symptoms may report seeing clouds of a yellow colored smoke or aerosol, but blue and green aerosols also have been reported.
- Symptoms of exposure to T-2 mycotoxins may resemble those of radiation exposure.
- Differential diagnosis would include exposure to Lewisite (has arsenic component), mustard (has delayed onset of dermal symptoms), Staphylococcal enterotoxin B (lacks skin and oral burn symptoms) and Ricin intoxication (painful topical symptoms are not experienced).

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## **Laboratory Procedures**

### **Specimens:**

Serum and urine can be collected for antigen detection. Pathologic specimens include blood, urine, lung, liver, and stomach contents. The mycotoxins and metabolites are eliminated in the urine and feces; 50-75% is eliminated within 24 hours, however, metabolites can be detected as late as 28 days after exposure.

**NOTE:** The Missouri State Public Health Laboratory does not conduct testing for T-2 mycotoxins. Contact the State Public Health Laboratory for instructions on how and where to request testing for T-2 mycotoxins.

## **Reporting Requirements**

T-2 mycotoxins exposure is a Category IB disease and should be reported to the local health authority or to the Missouri Department of Health and Senior Services immediately, by telephone, facsimile or other rapid communication.

1. For confirmed and probable cases, complete a “Disease Case Report” (CD-1).
2. For each case, gather information needed to complete a “T-2 Mycotoxicosis Investigation Report” (under development).
3. Entry of the completed CD-1 into MOHSIS negates the need for the paper CD-1 to be forwarded to the Regional Health Office.
4. Send the completed secondary investigation form to the Regional Health Office.
5. All outbreaks or “suspected” outbreaks must be reported as soon as possible (by phone, fax, or e-mail) to the Regional Communicable Disease Coordinator. This can be accomplished by completing the Missouri Outbreak Surveillance Report (CD-51).
6. Within 90 days from the conclusion of an outbreak, submit the final outbreak report to the Regional Communicable Disease Coordinator.

## **References**

1. Locasto D, and M Allswede, eMedicine Journal, “CBRNE – T-2 Mycotoxins”. January 13 2003, V 4, N 1 <http://author.emedicine.com/emerg/topic890.htm>, (8/03).
2. Kortepeter, Mark, et al, editors. “T-2 mycotoxins,” Medical Management of Biological Casualties Handbook, 4th Ed. February 2001, <http://www.usamriid.army.mil/education/bluebook.html>, (8/03).

# T-2 Mycotoxins

## FACT SHEET

### What are T-2 Mycotoxins?

T-2 or Trichothecene mycotoxins are toxic materials that come from fungi of the genus *Fusarium*. It has been suggested that they might be used in a bioterrorist attack. T-2 Mycotoxins occur naturally when the fungus that produces them grows in grain. A large number of people were sickened and died in Russia after World War II when wheat was left in the field over the winter, and then harvested in the spring and used.

### How would I get exposed to T-2 Mycotoxins?

T-2 mycotoxins can be absorbed through the skin, or they can be inhaled or ingested by mouth.

### How long after exposure before I become ill?

Symptoms can begin from within minutes to a few (2 to 4) hours, depending on the dose and route of exposure.

### What are the symptoms?

Symptoms vary by route of exposure.

- **Skin Contact:** Burning skin pain, redness and blistering, progressing to patches of skin death and sloughing off of the skin.
- **Inhaled:** Nasal pain, itching and bleeding; sneezing, runny nose, mouth and throat pain with blood tinged saliva, coughing, shortness of breath, wheezing, vomiting, and hallucinations.
- **Ingested:** Abdominal pain, nausea, vomiting, and bloody diarrhea.

Severe poisoning from any route may result in prostration, weakness, collapse, reduced cardiac (heart) output, shock and death.

### What should I do if I think I have been exposed?

- Leave the area of attack immediately. (Immediate decontamination is extremely important to reduce the amount of exposure to the toxin, and to avoid contamination of other persons.)
- Cover your nose and mouth (with a wet cloth if possible) or wear a respiratory mask if you have one.
- Do not touch people who have been in an attack.
- Do not touch your eyes, nose, or mouth.
- Decontamination
  - Remove your outer clothing as soon as possible.
  - Shower with plenty of soap and water.
  - Flush your eyes with large amounts of water.
- Gas masks with activated charcoal filters protect against T-2 inhalation; however, unless you have been trained to use a gas mask and it has been fitted to your face, do not trust it to protect you.
- Notify your health care provider immediately, and follow his/her directions.

- Contact the Missouri Department of Health and Senior Services immediately (24/7) at **(800) 392-0272**.
- The regional poison control center may be contacted at: (800)-222-1222.

**Is there any treatment?**

There is no specific antidote or vaccine available for T-2 mycotoxin exposure at this time. Your health care provider will provide supportive measures addressing respiratory and cardiovascular status as necessary. Your health care provider may administer activated charcoal if toxin ingestion is a possibility. If there is eye pain or tearing, the eyes should be irrigated with copious amounts of water.

**Is T-2 poisoning life threatening?**

Yes, especially when absorbed through the skin.

**Missouri Department of Health and Senior Services  
Section for Communicable Disease Prevention  
Phone: (866) 628-9891 or (573) 751-6113**

# MISSOURI DEPARTMENT OF HEALTH & SENIOR SERVICES

## Division of Environmental Health & Communicable Disease Prevention

### Regions for Statewide Disease Investigation / Terrorism Response



**Patrick Franklin, ES\* (816) 350-5442**

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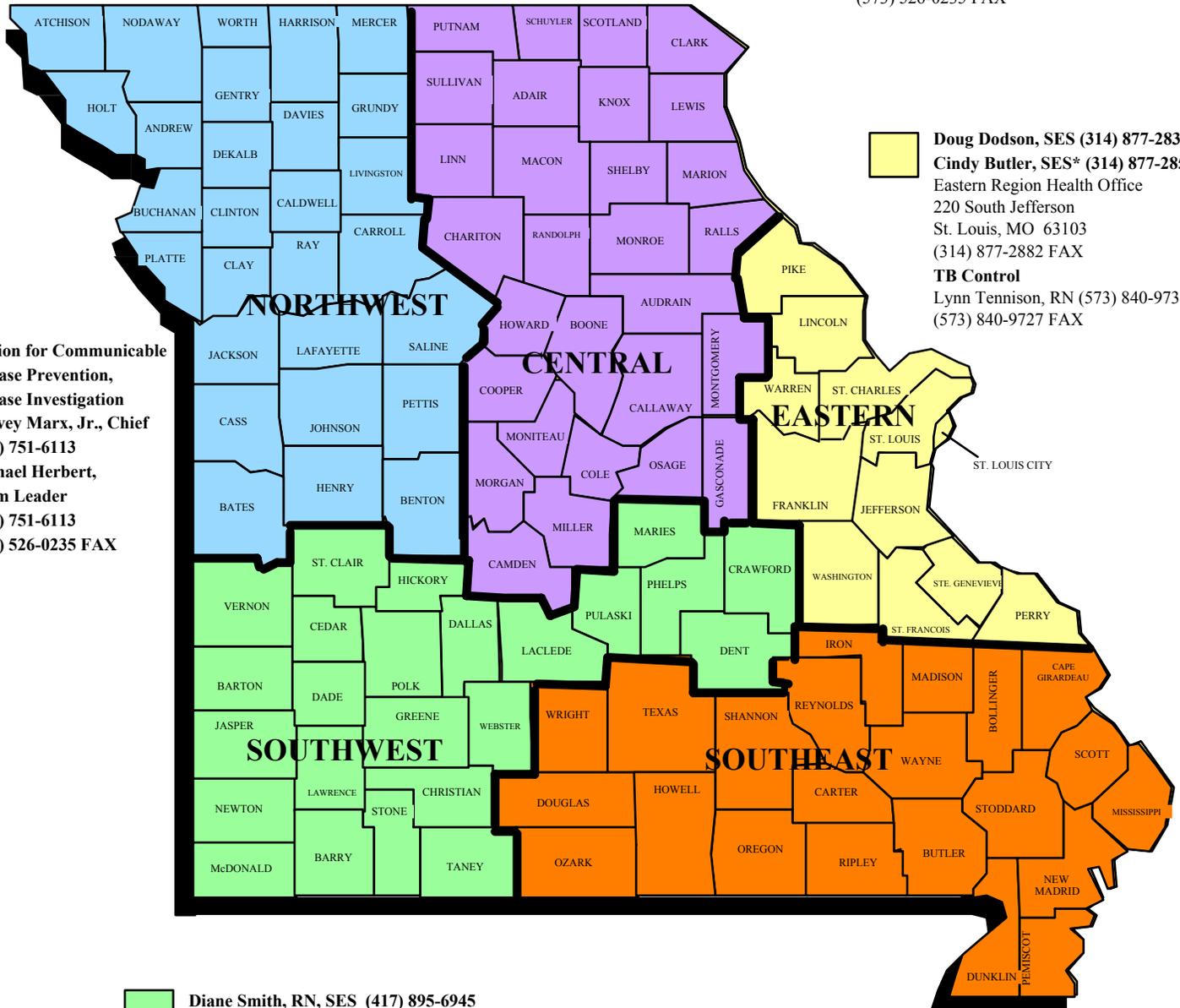


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Asterisk (\*) denotes Regional Communicable Disease Coordinator



MISSOURI DEPARTMENT OF HEALTH AND SENIOR SERVICES  
**DISEASE CASE REPORT**

REPORT TO LOCAL PUBLIC HEALTH AGENCY

1 DATE OF REPORT ____/____/____	2 DATE RECEIVED BY LOCAL HEALTH AGENCY ____/____/____
------------------------------------	----------------------------------------------------------

3 NAME (LAST, FIRST, M.I.)		4 GENDER <input type="checkbox"/> MALE <input type="checkbox"/> FEMALE	5 DATE OF BIRTH ____/____/____	6 AGE	7 HISPANIC <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> UNKNOWN
8 RACE (CHECK ALL THAT APPLY) <input type="checkbox"/> BLACK <input type="checkbox"/> ASIAN <input type="checkbox"/> PACIFIC ISLANDER <input type="checkbox"/> WHITE <input type="checkbox"/> AMERICAN INDIAN <input type="checkbox"/> UNKNOWN		9 PATIENT'S COUNTRY OF ORIGIN		10 DATE ARRIVED IN USA ____/____/____	
11 ADDRESS (STREET OR RFD, CITY, STATE, ZIP CODE)			12 COUNTY OF RESIDENCE		13 TELEPHONE NUMBER ( )
14 PREGNANT <input type="checkbox"/> YES (IF YES NUMBER OF WEEKS _____) <input type="checkbox"/> NO <input type="checkbox"/> UNKNOWN		15 PARENT OR GUARDIAN		16 RECENT TRAVEL OUTSIDE OF MISSOURI OR USA <input type="checkbox"/> YES <input type="checkbox"/> NO IF YES, WHERE _____	
18 OCCUPATION		19 SCHOOL/DAY CARE/WORKPLACE		ADDRESS (STREET OR RFD, CITY, STATE, ZIP CODE)	

20 WORK TELEPHONE NUMBER ( )	21 OTHER ASSOCIATED CASES IS REPORT PART OF AN OUTBREAK <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> UNKNOWN	22 TYPE OF COMPLAINT/OUTBREAK <input type="checkbox"/> FOODBORNE <input type="checkbox"/> WATERBORNE <input type="checkbox"/> OTHER (SPECIFY) _____	26 CHECK BELOW IF PATIENT OR MEMBER OF PATIENT'S HOUSEHOLD (HHL):		
23 WAS PATIENT HOSPITALIZED <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> UNKNOWN	24 PATIENT RESIDE IN NURSING HOME <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> UNKNOWN	25 PATIENT DIED OF THIS ILLNESS <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> UNKNOWN	27 NAME OF HOSPITAL/NURSING HOME		
28 HOSPITAL/NURSING HOME ADDRESS (STREET OR RFD, CITY, STATE, ZIP CODE)			29 REPORTER NAME		
31 REPORTER ADDRESS (STREET OR RFD, CITY, STATE, ZIP CODE)			30 TELEPHONE NUMBER ( )		
33 ATTENDING PHYSICIAN/CLINIC NAME			32 TYPE OF REPORTER/SUBMITTER <input type="checkbox"/> PHYSICIAN <input type="checkbox"/> OUTPATIENT CLINIC <input type="checkbox"/> PUBLIC HEALTH CLINIC <input type="checkbox"/> HOSPITAL <input type="checkbox"/> LABORATORY <input type="checkbox"/> SCHOOL <input type="checkbox"/> OTHER		
33 ATTENDING PHYSICIAN/CLINIC NAME			34 TELEPHONE NUMBER ( )		

35 DISEASE NAME(S)	36 ONSET DATE(S) ____/____/____ ____/____/____	37 DIAGNOSIS DATE(S) ____/____/____ ____/____/____	38 DISEASE STAGE/ RISK FACTOR	39 PREVIOUS DISEASE/STAGE	40 PREVIOUS DISEASE DATE(S) ____/____/____ ____/____/____
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41 - DIAGNOSTICS

TEST DATE (MO/DAY/YR)	TYPE OF TEST	SPECIMEN TYPE	COLLECTION DATE (MO/DAY/YR)	QUALITATIVE / QUANTITATIVE RESULTS	REFERENCE RANGE	LABORATORY NAME/ADDRESS (INCLUDE STREET OR RFD, CITY, STATE, ZIP CODE)

42 - TREATMENTS

TREATED (Y/N/UNK)	REASON NOT TREATED	TYPE OF TREATMENT	DRUG	DOSAGE	TREATMENT DATE (MO/DAY/YR)	TREATMENT DURATION (IN DAYS)	PREVIOUS TREATMENT	PREVIOUS LOCATION (LIST CITY, STATE)

43 - SYMPTOMS

SYMPTOM (IF APPLICABLE)	SYMPTOM SITE (IF APPLICABLE)	SYMPTOM ONSET DATE (MO/DAY/YR)	SYMPTOM DURATION (IN DAYS)

44 COMMENTS
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**NOTES FOR ALL RELEVANT SECTIONS:**

- Stages, risk factors, diagnostics, treatments, and symptoms shown below are examples. To see a more complete listing, please go to <http://www.dhss.state.mo.us/Diseases/DDwelcome.htm>. You may also contact the Office of Surveillance at 1-800-392-0272 for additional information or to report a case.
- All dates should be in Mo/Day/Year (01/01/2001) format.
- All complete addresses should include city, state and zip code.
- Required fields referenced below are italicized and bold, however fill form as complete as possible.

(1) **Date of Report** -- date sent by submitter of document.

(2) Date received will be filled in by receiving agency.

(3-8) **CASE DEMOGRAPHICS/IDENTIFIERS: Last name, First Name, Gender, Date of Birth, Hispanic, Race** - please check all that apply

(23) Was patient hospitalized due to this illness?

(32) Type of reporter/submitter (doctor, nursing home, hospital, laboratory) (33-34) Attending physician or clinic (full physician name and degree, address, phone)

**DISEASE: (35) Disease name or name(s), (36) Onset date(s), (37) Diagnosis Date(s)**

**(38) Disease Stage or Risk Factor**

**Syphilis**

- Primary (chancre present)
- Secondary (skin lesions, rash)
- Early Latent (asymptomatic < 1 year)
- Late Latent (over 1 year duration)
- Neurosyphilis
- Cardiovascular
- Congenital
- Other

**Gonorrhea or Chlamydia**

- Asymptomatic
- Uncomplicated urogenital (urethritis, cervicitis)
- Salpingitis (PID)
- Ophthalmia/conjunctivitis
- Other (arthritis, skin lesions, etc)

**TB Infection**

- Contact to TB case
- Immunocompromised
- Abnormal CXR
- Foreigner/Immigrant
- IV Drug/Alcohol Abuse
- Resident, correctional
- Employee, correctional
- Over 70
- Homeless
- Diabetes
- Healthcare worker
- Converter/2 yrs ≥ 10
- Converter/2 yrs ≥ 15

**(39) Previous Disease/Stage (if applicable) (40) Previous Disease Dates (if applicable)**

**(41) Diagnostics (Please Attach Lab Slip)**

**Test Type**

**Hepatitis**

- Igm Anti-HBc
- Anti-HBs
- Anti-HBc Total
- Igm Anti-HAV
- HBsAg
- Hep C

**TB**

- Not Done
- Mantoux
- Multiple puncture device
- X-Ray
- Smear
- Culture

**Other**

- Elisa
- Western Blot
- Culture
- ALT
- AST

**Specimen Type** (blood, urine, CSF, smear, swab), **Collection Date** (Mo/Day/Yr), **Qualitative** (negative, positive, reactive), **Quantitative Results** (1:1, 2.0 mm reading,) **Reference Range** (1:1neg, 1:64 equivocal, 1:128 positive, > 2 positive), **Laboratory** (name, address)

**(42) TREATMENT**

**Reason not treated**

- False positive
- Previous treated
- Age

**Drug**

**TB**

- Isoniazid
- Ethambutol
- Pyrazinamide
- Rifampin

**(43) SYMPTOMS:**

**Symptom** (jaundice, fever, dark urine, headache) **Symptom Site** (head, liver, lungs, skin), **Symptom Onset Date** (Mo/Day/Yr) and **Symptom Duration** (in days)

(44) **Comments:** Attach additional sheets if more comments needed.